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JOURNAL OF THE
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OF
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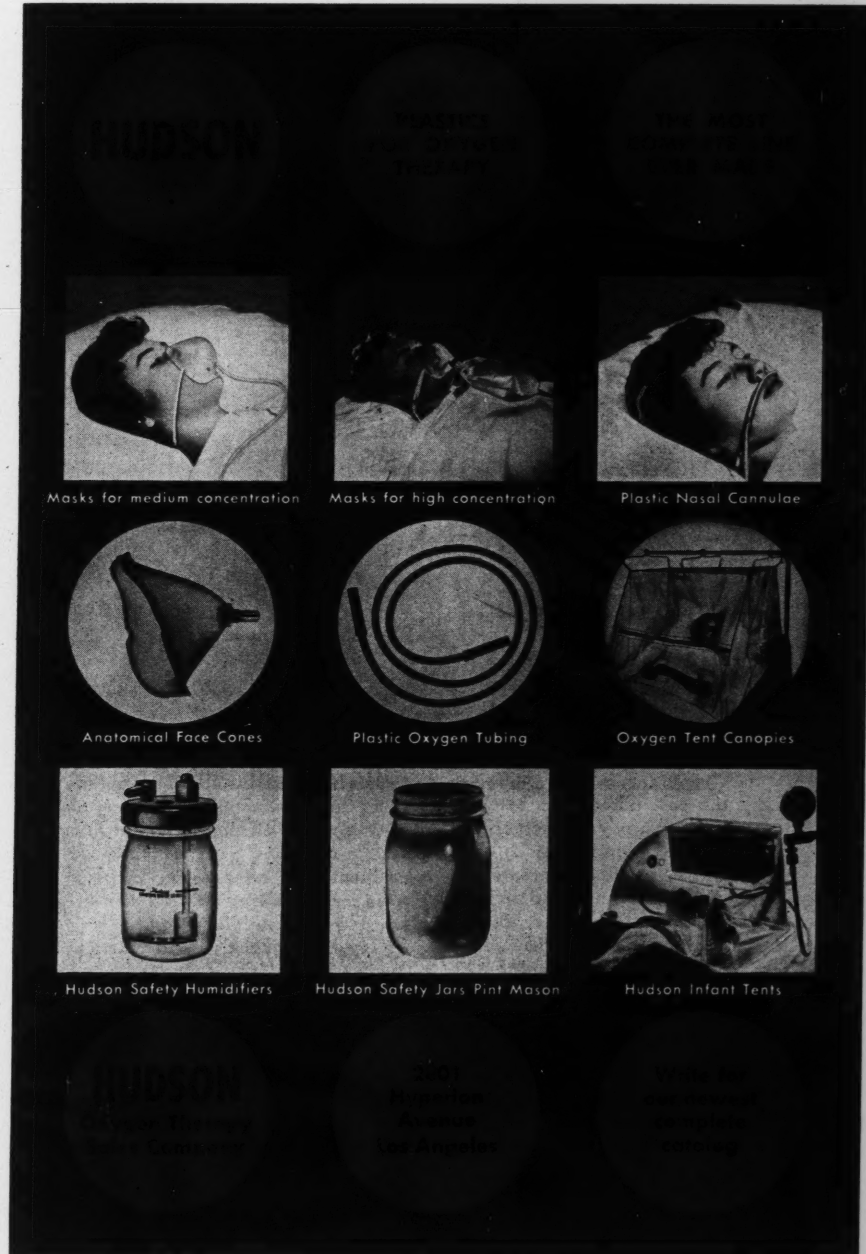

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Vol. 2, No. 1 March, 1957

## AMERICAN ASSOCIATION OF INHALATION THERAPISTS

# *"Inhalation Therapy"*

**"Inhalation Therapy" is the official publication of the American Association of Inhalation Therapists, an organization of therapy technicians working in hospitals and for firms providing emergency therapy service. The Association is sponsored by the American College of Chest Physicians. Contents include news and information pertinent to the profession including medical research, operative techniques, and practical administration.**



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# Editorial

## "Just What the Doctor Ordered"

THE MATTER of ordering inhalation therapy for patients is becoming, like the therapy techniques themselves, increasingly complex. It used to be that if a doctor wrote, "Place a patient in an oxygen tent," no one thought anything amiss with the order; but nowadays most competent therapists would wish for more specific orders.

One of the harrassing questions many of us hear is, "What's the liter flow?" regarding a mask or some other piece of equipment. "How much detergent do we put in?" is another one. Always *one* standard value is wanted to cover all cases using mask or aerosol or whatever sort of therapy is involved.

Unfortunately, this is not all the physician's fault. It is bred by two things: (1) tables in texts which are intended only as tentative guides to concentrations obtainable with certain gas flows in certain equipment, and (2) labels put on equipment by well meaning manufacturers who test the equipment under optimum conditions – which do not always obtain in actual usage.

We must try to bring our doctors and nurses to the realization that no set flow rate can or should be adhered to, but rather a definite *concentration* should be prescribed for each individual patient, and *whatever flow is necessary to reach and maintain it is the one to use.*

Masks are a special case, in that, besides concentration considerations, one must keep the bag nearly inflated, and if this requires 15 liters per minute at one time and only 5 at another, so be it. With masks, no set flow rate can be named and the patient left with that setting. His demands may change, either way, necessitating compensatory adjustments in rate of oxygen flow. This is also the case with patients using tracheotomy appliances, which are often practically closed systems too. Since the patient's chief source of inspired air is usually the mask fitted over his face or

tracheostomy, these patients need very close supervision to follow and meet their changing needs, if the inhalation therapy is to be really effective.

"Fifty percent oxygen via tent" cannot truly mean any particular liter flow rate either, even though various authors suggest tentative figures which, under ideal conditions, might be expected to accomplish given concentrations. Doctors, nurses, and others often grasp these figures like drowning men clutching at straws, and hold them inviolate even in the face of analyses that show a tent is not giving such and such a concentration at a certain liter flow of oxygen.

We must enlighten them that there are, after all, no two tents that are just alike — not even two of the same model — and that to attain the 50% concentration prescribed may require 16 liters per minute in one and only 12 in the other. This is, of course, due not only to individual differences in tents, but also to unavoidable and only partially controllable variations in patient-tent situations. Hence, the best tent in the house, which will give concentrations up to 70% or more with some patients at, say, 12 or 14 liters per minute, may only give 45% with other patients (with same oxygen input), owing to poorly tucked-in canopy or other sloppinesses in technique which cannot always be eradicated.

This situation, it follows logically, is one of the big arguments in favor of concentration analyses periodically — so that if prescribed concentrations are not being maintained at a given flow, the rate can be increased until they are. (It should not be overlooked, however, that often the concentration can be raised by repairing leaks and faulty zipper closures, and tucking properly.)

It also clearly calls for better liaison with our doctors in which we must (1) assure them of our eagerness to see that their patients get the therapy really intended for them, and (2) tactfully advise the doctors that, in order to do this, we must have more detailed and specific orders from them.

*—J. F. W.*

## Representation

IF IT SEEMS to you that any one person or group is mentioned or represented quite often (or too often) in the journal, bear in mind that we cannot print *your* news or views unless we have them! We are trying to be as representative as we can, within the limits of the material which comes to us for consideration; but naturally, the more active areas where things are really happening are the ones that send us the most material — and probably these are of interest to most of our readers — especially, they should be stimulating to members in areas where there *isn't* much going on in the way of starting up new ventures, reorganizing, expanding, teaching, etc. If there are significant developments in your hospital or area, or if you disagree with any views presented anywhere in the journal, won't you please let us know? We have no way of finding out these things unless you tell us!

# *Respiration Physiology*

## Apparatus
## Mechanics
## Pressure Changes

ALL animals in order to continue their metabolic processes must burn foods to produce energy. The chemical reactions involved in this fuel consumption require oxygen and ordinarily produce carbon dioxide as a waste product. We are all faced, therefore, with the necessities of oxygen acquisition and $CO_2$ disposal. For the ameba, this poses no particular problem, as he does everything in his one cell, and the oxygen diffuses in and $CO_2$ out through his cell wall into the surrounding medium with no difficulty.

**We plan to have an article on basic respiratory Physiology in each quarterly issue of Inhalation Therapy in 1957. The four aspects to be considered will be:**

**I. Apparatus, Mechanics, Pressure Changes**

**II. Lung Volumes, Respired Gases, Diffusion Gradients**

**III. Nervous and Chemical Control of Respiration**

**IV. Transport of Oxygen by the Blood**

**The material presented can be found considerably amplified in the references listed at the end of each article. This subject, like most branches of physiology, can be made as simple or as complex as one chooses. We hope that therapist readers will not find these presentations to be at either extreme. —Ed.**

However, as we pass from the one-celled to the multi-cellular and multi-system organisms, more and more of the cells get farther and farther away from the outside surfaces where the interchange can take place so readily. Consequently there have been developed the elaborate respiratory and circulatory systems of the human, which enable us to get $O_2$ to the innermost cell and $CO_2$ away from it. This, then, is the real essence of respiration, and not merely getting air into and out of the lungs. Nevertheless, this first step is sufficiently involved to be subject to a number of disorders, and is therefore a matter of interest to the inhalation therapist.

The physical apparatus available for the task of getting oxygen to the bloodstream and $CO_2$ away from it consists of the oronasal airway, trachea, bronchi and further subdivisions of the lungs; the ribs and the intercostal muscles between them; the diaphragm and the abdominal muscles.

A little detail about some of these structures is in order. (See Fig. 1.) The largest tubes, the trachea and primary bronchi, have cartilage rings which serve to keep them open. The secondary (smaller) bronchi have irregular cartilaginous plates, and the next smaller subdivision, the bronchioles (tubes

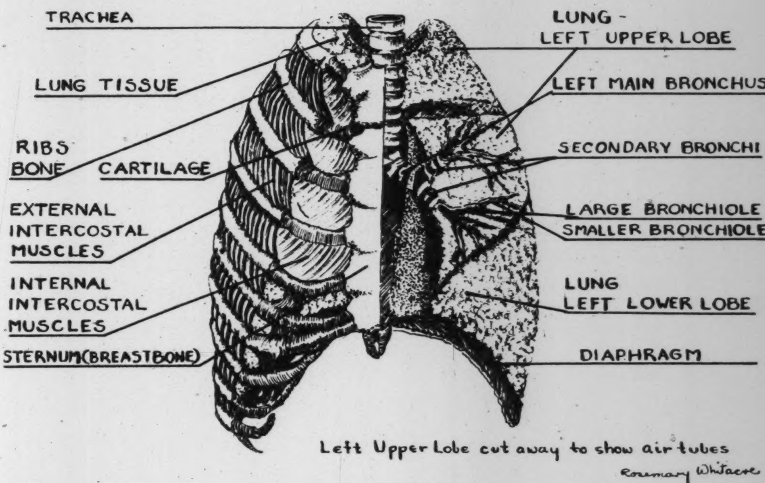


**Fig. 1. Gross Structures of the Thorax**

down to about 1 millimeter diameter) have almost none, being formed mostly of smooth muscle and connective tissue fibers. All of these tubes are lined by cells which either secrete mucus or have little hairlike projections called cilia. Dust and other impurities in the air get stuck in the mucus, and the cilia, which are constantly beating, gradually waft the foreign materials and mucus up to the pharynx where they are swallowed.

Beyond the bronchioles are the respiratory bronchioles (Fig. 2) (diameter about 0.5 mm), which are lined simply with flat thin cells without cilia. These lead into the alveolar ducts, from which branch off the alveoli or terminal air sacs of the lungs. The alveoli are extremely thin-walled spaces which have a total surface area (both lungs) of about 100 square meters. They are surrounded by millions of capillaries from the branches of the pulmonary arteries, and the gas exchange between blood and outside air occurs across the alveolar and capillary walls.

The mechanism by which the air is moved from outside down into the alveoli functions on the basis of pressure changes developed by the respiratory musculature. It is well to consider here the structure of the chest. See Figure 1. This is a representation of the chest showing the ribs and the muscles between them on the left, and the branching of the trachea into the left bronchus and bronchioles on the right. At the bottom is the diaphragm, the large dome-shaped muscle that divides the torso into thoracic and abdominal cavities. When the diaphragm is at rest, it is curved upwards as shown here. During inspiration, however, it shortens and therefore flattens down the top of its arch. This materially increases the vertical dimension of the chest cavity.

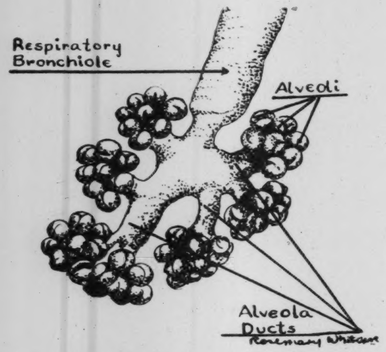


**Fig. 2. Greatly Enlarged View of Terminal Respiratory Passages**

It will be noted that there are two sets of muscles between the ribs—the external and the internal intercostals, and that their fibers run at oblique angles to the ribs and practically at right angles to each other. When the outer set contracts (shortens), the ribs are lifted upwards and outwards; when the inner ones contract, the ribs are pulled downwards and inwards. It can be seen from Fig. 3 that when the external intercostals are shortened during inspiration, the front-to-back dimension of the thorax is increased. As a matter of fact, the side-to-side dimension is also increased, owing to the curved shape of the ribs. Hence, on inspiration, the result of the contraction of the various muscles is to increase the size of the thoracic cavity in all dimensions, thus creating a greater volume.

Let us now examine what is happening inside the chest. Fig. 4 is a schema to represent the relationships between certain structures of the thorax. The heavy outside line suggests the chest wall (ribs and muscles). Just inside the wall is a membrane called the parietal pleura, and inside that is another known as the visceral pleura. They are indicated here by dotted lines, and are separated by a potential space whose size is deliberately exaggerated to make it more easily visible. The space is called the intrapleural space and is normally extremely minute and is filled with fluid.

Notice that, whereas the lungs communicate with the outside via the trachea, the chest cavity itself does not. There is no opening of the chest cavity either to the inside or the outside. Each lung is enclosed (except where it emerges into its bronchus) in a pleural sac, which is made up of these two layers, the parietal and visceral pleuras. In pleurisy it is these membranes which become inflamed, and friction of the irritated parts over each other and against the ribs during the respiratory movements is what causes the pain.

The pleuras are mucus membranes and coated with fluid. The parietal one clings to the wall of the

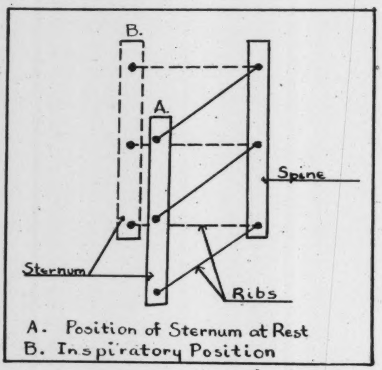


**Fig. 3. Diagram illustrating dimensional changes of Thorax occasioned by movements of the ribs.**

chest and the visceral one clings to the outer surface of the lung, but they also tend to stick to one another because of a very slight negative pressure in the intrapleural space between them. When the lung tends to collapse on expiration, it pulls inwards away from the chest wall, pulling the visceral pleura along with it. But the visceral pleura is held to the parietal pleura by the negative intrapleural pressure, and the parietal pleura is held to the ribs by a similar partial vacuum between it and the chest wall.

This can be compared with trying to pull out the plunger of a wet syringe when one has the finger over the needle end of the barrel. The space between the plunger and the barrel is airtight and has a water seal, just like the intrapleural space. The barrel and the plunger would correspond to the two pleuras. The harder one pulls to try to separate them, the greater the negative pressure developed between them and consequently the harder it is to separate them. It is this negative intrapleural pressure which keeps the lungs always partially inflated and prevents their complete collapse.

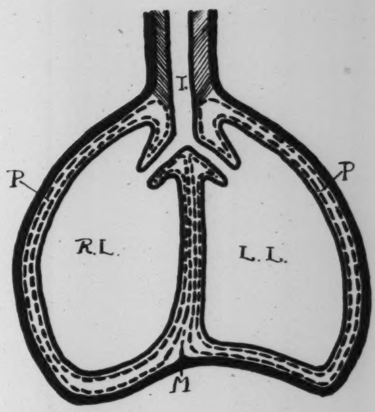


**Fig. 4. Schema to illustrate parietal and visceral pleuras and their relationships to other thoracic organs. P denotes the intrapleural space; T, the trachea; M, the mediastinum (partition between halves of the thorax); R.L. and L.L., the right and left lungs.—From Howell, 14th ed., p. 648.**

### Negative Pressure

As the thorax increases its volume on inspiration by the muscular activity already discussed, the pressure inside the chest cavity becomes more and more negative. This is because it is an air-tight cavity and we are moving out its walls to make its volume larger. But since no more air can go in, the partial vacuum (negative) already present is increased. This makes the pleuras follow the chest wall, and since the lung is a very elastic structure, it willingly goes along with them, and its own volume is thereby increased. This creates a similar negative pressure within the lungs, but since *they* are open to the outside, air immediately rushes in to equalize this with the atmospheric pressure outside.

When we exhale, the ribs and diaphragm return to their rest positions, decreasing the dimensions of the thorax markedly. The elastic tissue of the lungs lets them become smaller, and part of their contained air is expelled. The continuing negative intrapleural pressure, however, prevents the lung from collapsing altogether. This pressure is very important, as can readily be appreciated in the event of an accident such as a gunshot or stab

wound of the chest, where air enters the intrapleural space and equalizes its pressure with the outside air. Now the elastic force of the lung, which always tries to shrink the lung to its smallest size, is no longer opposed by the negative intrapleural pressure, and the lung collapses. The condition is known as Pneumothorax, and can also arise where the perforation occurs from within, caused by disease or growths.

The exhalation we have just discussed is the normal quiet sort we use under ordinary rest conditions. It is a passive process in which the diaphragm and external intercostal muscles merely relax and return to their rest positions. The ribs are assisted in this by gravity. The elastic recoil of the lungs reduces their size as far as the negative intrapleural pressure will permit.

Under conditions of exertion or excitement, however, it often is desirable to get the air out of the lungs faster, and to get more of it out on each expiration (as well as to get more *in* faster on inspiration). In this circumstance, expiration becomes an active process in which the *internal* intercostal muscles contract vigorously. This pulls ribs downwards and inwards faster and farther than usual. Simultaneously the muscles of the abdominal wall contract and this forces the stomach and intestines upwards against the under surface of the diaphragm. This moves it upwards farther and faster than its own mere relaxation would. The result of these two mechanisms is the faster and more complete emptying of the lungs.

In summary, the chest cavity is an airtight chamber, in which are situated the lungs which communicate with the outside air via the trachea and its branching airways. The elastic nature of the lung tissue makes it tend always to collapse. This tendency is opposed by the negative pressure in the intrapleural space. During inspiration, the chest volume is increased, creating a negative pressure in the lungs. Air then enters because atmospheric pressure is higher than that in lungs. On expiration (either passive or active) the volume of the thorax decreases, the lungs' elasticity reduces their size, creating a momentary positive pressure on the contained air, part of which then moves out to the relatively lower atmospheric pressure outside.

The air movements in and out of the lungs are thus seen to be due to changes in the pressure relationships between the thorax and the outside air. These changes are brought about by volume changes of the thorax, which in turn are effected by action of the respiratory muscles on the rib cage.

**References:**

Howell: **Textbook of Physiology,** 14th & 17th eds., W. B. Saunders Co., Philadelphia

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**Acknowledgement:** We are indebted to Mrs. Rosemary Whitacre for the art work in connection with redrawing and modifying the figures, which are composites from several sources.

## *The Establishment and Operation of*

# Inhalation Therapy Sales & Rental Services

*By* MAX E. GLASSER
*Professional Oxygen Service*

IN ORDER to classify the interests and fields of operation in Inhalation Therapy, the American Association of Inhalation Therapists has properly differentiated between Active and Associate members. The Active members include those directly concerned in the application of therapy; associate members are those concerned with the commercial phases—chiefly, the manufacture and distribution of supplies and equipment. In any attempt at classification, there is always a hybrid group that overlaps the functions of others, and in this case the hybrid group is sales and rental agencies.

Even within this latter group there are many different modes of activity. Some serve essentially as sales agencies; others as a continuation of the inhalation therapist's activities at the patient's home; still others serve in carrying out such functions in smaller hospitals and institutions not having their own departments; and others combine all the above functions. In this article, the author, who is connected with Professional Oxygen Service of Miami, Florida, will attempt to state briefly the manner of operation there, and to show how fundamentally this concerns the practices and procedures and advancement of Inhalation Therapy.

Late in 1946, when Professional Oxygen Service first started in business in the Miami area, the field of Inhalation Therapy there was considerably undeveloped. Only one of the hospitals was able to boast an Oxygen Therapy department—and in this as well as in all other hospitals there, the equipment and practices left much to be desired. In many cases, hospitals, administrators, and doctors with patients to be treated at home, considered oxygen therapy as a necessary evil. With the lack of trained and interested personnel and adequate equipment, such therapy was confined to those cases where it just had to be used.

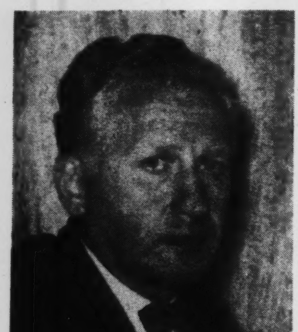
The immediate problem was twofold. First, to get the doctors familiar with the most advanced procedures and equipment, its availability, and assurance that the patient could be cared for properly. This was accomplished, and continues to be effected by persistent personal contact with doctors, by judicious use of all educational aids, and by honest evaluation of conflicting claims for various types of equipment. As the medical men became assured of the fact that this move was permanent, they were encouraged to order therapy and equipment for their patients.

### Hospital Administrators

The second phase concerned careful explanation of the situation to hospital administrators. With constant application and sincerity we proved our desire to consider

the best interests of the institution. Despite administrators' initial reluctance to have our men assigned to care for the inhalation therapy equipment, we showed time and again the many advantages of such a move. In order to overcome the objections of putting additional stress on the hospitals' budgetary requirements, we worked out an equitable rental arrangement whereby the doctor could always get whatever equipment he needed, and the institution—with no capital outlay—could always have available the latest devices, properly functioning, and secure such services at a rate permitting them to gain a return on the use of equipment.

To provide further evidence in favor of this procedure, we urged the hospitals to keep careful records of the usage and return. Whenever these showed that the hospital had made several times the cost of any equipment, we could easily convince them to purchase it, and we would take up the seasonal or short-term heavy demand for more units by renting them



**Max Glasser, author of this article, is very active in the affairs of the Florida Chapter, AAIT. He is a technician as well as a service company operator.**

such. Most of all, we were able to show the administrator that good equipment did not cost: it paid.

As the use of therapy increased, the demand for trained technicians became more apparent. In our own organization, each man is thoroughly trained, not only in every phase of inhalation therapy, but in proper handling of patients and clients. We find no use for a man, regardless of his ability or other qualifications, if he does not sincerely appreciate the responsibilities and objectives of good inhalation therapy. This same attitude, plus the recognition by doctors and hospitals of our desire and ability, has been instrumental in establishing oxygen therapy departments in every one of our major hospitals.

## Training

In establishing these departments, we have cooperated with the administrations in working with their men. We spend any needed time with each hospital; we explain, demonstrate, service, and set up departmental procedures. Whenever new equipment is made available to the trade, we secure reprints of the notices for doctors and explain the modifications. We familiarize the technicians with the equipment, and assure the administrative and nursing staffs that we will be able to meet requests.

Recently, we have been instrumental in formulating an extensive set of questions to be used in training technicians, with the ultimate object of grade classification for promotion in the field. Training and education are by far our most successful approaches. Wherever and whenever anyone or any size group of doctors, nurses, techni-

cians, aides or any related group will listen, we talk Inhalation Therapy, demonstrate equipment, and instill confidence in therapy. These meetings are arranged at any hour of any day, so as to accommodate various shifts of hospital employees.

Shortly after attending a meeting of the AAIT, we were stimulated to found a local organization. The Florida Inhalation Therapists Association resulted from contacting every man in the field and uniting them into a functional unit. Our association is recognized by every local hospital; the doctors are extremely helpful and cooperative in volunteering their services as guest speakers; the commercial houses have given their wholehearted support.

The result of all this is that Inhalation Therapy in the Greater Miami area has moved ahead, become recognized, and increased in scope and responsibility. It is of interest to note that all this development has resulted in our area's being one of the foremost in the country in the adoption and practice of the most advanced therapy procedures. With the establishment of several pulmonary function labs, we should have further opportunity to learn, and to improve our service.

**Headquarters of Miami's Professional Oxygen Service.**

The outside man—the rental service representative—is in the best position to unite the loose ends of a disorganized inhalation therapy situation into a cohesive functional organization. His interest goes beyond merely initiating the program —it is to his benefit to see that it grows steadily and becomes ever more beneficial to all concerned.

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## Association News Briefs

The Association's part in the Tri-State Hospital Assembly, held in Chicago each year in the latter part of April and early May, is rapidly taking shape under the guidance of Larry Fruik and Bob Kruse, both members of the Greater Chicago Chapter. Tuesday, April 30th, the program will concern the "how" and "why" of establishing an inhalation therapy department and on Wednesday, May 1, the papers and discussions will concern tent therapy. Tuesday's program will be handled by Administrator Frank Brown and Therapist Larry Fruik under the direction of Dr. E. R. Levine, all of Edgewater Hospital in Chicago. Wednesday's program will include a report by Dr. Albert Andrews on the work at the Inhalation Therapy Laboratory at St. Lukes Hospital in Chicago as well as talks by other Doctors prominent in the field of respiratory physiology.

# PREVENTIVE MAINTENANCE,

## *key to good inhalation therapy*

*By* FRED HEAD*

MOST HOSPITALS have invested several thousands of dollars in inhalation therapy equipment. Proper use of this equipment is of paramount importance, but of equal importance is the proper maintenance of the equipment, so that it is ready at all times to perform its life-saving function.

Industry has long recognized the economy of establishing preventive maintenance schedules for production machinery and equipment. Each of us knows about and uses preventive maintenance on our automobiles—most of us wash them, change the oil and grease them regularly.

Establishing a preventive maintenance schedule for inhalation therapy equipment will save the department money and make it possible to give good therapy at all times.

Preventive maintenance is not difficult if a routine is established. Don't rely upon memory or the memory of assistants as a factor in the performance of maintenance chores. Keep a maintenance record book on all major pieces of apparatus, and have the book initialled by whoever performs the maintenance required each month.

### Tents

Pictured in Figure 1 is a suggested maintenance schedule for an oxygen tent. Records that we have studied show that the major complaint on oxygen tents is that they

*Service Mgr., O.E.M. Corp.

EQUIPMENT MAINTENANCE SCHEDULE

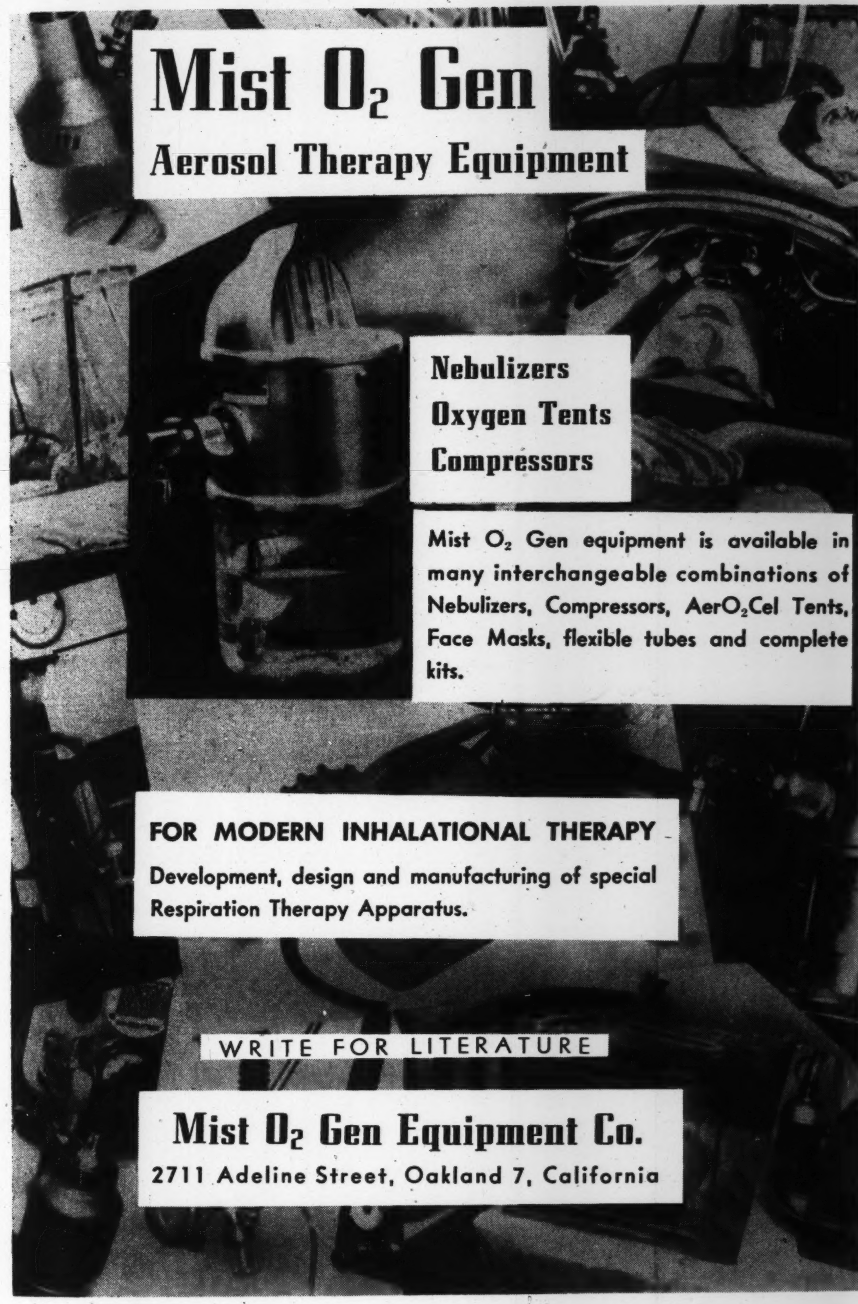
TYPE - OXYGEN TENT
MODEL AND MANUFACTURER - O.E.M. #50
SERIAL NUMBER - 11,702
DATE ACQUIRED - 3/5/55

| | JAN. | FEB. | MAR. | APR. | MAY | JUN. | JUL. | AUG. | SEPT. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CLEAN CONDENSER COIL CHANGE FILTER | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| 2. OIL BLOWER MOTOR | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| 3. CLEAN EVAPORATION COIL | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| 4. CALIBRATE TEMPERATURE CONTROL | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| | J.D. Brown | J.D. Brown | G.O. Smith | G.O. Smith | J.H | | | | | | | |

REMARKS:

3/17/57 Acme Refrigeration Service fixed gas leak and recharged with Freon

FIGURE 1.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run too hot. Oxygen tents may run too hot because (1) the condenser coil in the compressor compartment is covered with lint and dust, (2) the blower motor is not circulating the air properly because it is not running efficiently, due to lack of oil, (3) lint has collected on the evaporator coils, (4) temperature control is out of calibration, and (5) loss of Freon refrigerant or a faulty compressor.

Of the five major causes of complaints on "hot" tents, four of them can be avoided with preventive maintenance. Setting up a schedule to perform these tasks each month, or as frequently as the manufacturer recommends reduces deterioration of equipment.

In addition to a preventive maintenance schedule, repairs that have been performed on the piece of equipment should be recorded. A good medical history on a patient is an important guide to the doctor, and so, too, a good history on equipment is a guide in making the proper repairs.

Most manufacturers of equipment prepare booklets that can be used as a guide in making minor adjustments and in finding trouble. These booklets should be kept available and used as a guide in setting up preventive maintenance schedules.

## Regulators

Preventive maintenance is important on even so-called minor equipment like the oxygen regulator, the work-horse of inhalation therapy. We become so used to the operation of a regulator it is easy to forget the difficult job it does. A regulator requires attention too. Consider its job of controlling oxygen in cylinders under a pressure of 2200 psi, and you will treat regulators with more respect. Twenty-two hundred pounds per square inch pressure is a tremendously destructive force should it get out of control, and the regulator's job is to control this force.

You are well aware that oil and grease should not be used on oxygen regulators, because the oil coming in contact with oxygen under high pressure can ignite. You probably learned this important safety point the first day you handled oxygen therapy apparatus.

However, in traveling to many hospitals, servicing equipment, only a few hospitals can be found which follow two important procedures with their regulators. First—after each case, the regulator *flow accuracy* should be checked. This is extremely important, since the regulator controls the accuracy of the oxygen flow to the patient; and nurses and doctors use the liter flow rate as a guide in the treatment of their patients. The most exact way to check the flow accuracy of a regulator is by use of a spirometer and a stop-watch. The flow is set at a pre-determined rate, and the time is recorded in which the spirometer rises to the prescribed volume. If the flow is incorrect, the regulator is in need of repair.

Second — a regulator should be checked for leaks. A regulator can be checked for leaks by attaching it to a cylinder, being sure the flow adjusting handle is loose, opening the cylinder valve fully and then

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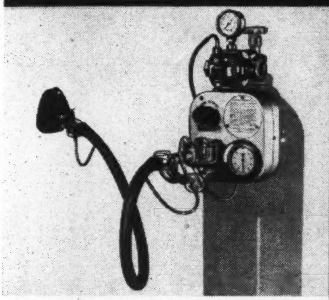
# DOTCO IPPB UNITS



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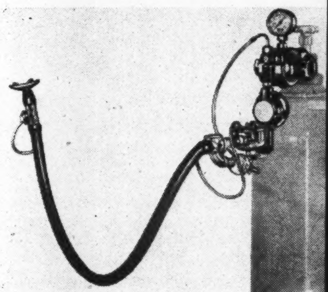

Price $199 in continental U.S.A.

Prices are F.O.B. Madison, Wis., and are subject to change without notice.

This apparatus provides intermittent positive pressure breathing *and* automatic intermittent positive pressure resuscitation, yet it responds to the patient's breathing efforts. Each unit can deliver a high aerosol concentration to assist breathing without reducing cardiac output or tiring the patient.

## THE RESPIRATOR

is especially suited for hospital, clinical, or office use by experienced personnel. Simple adjustments provide any true mouthpiece pressure (negative and positive) which registers on gauge. Available in cylinder or pipeline models. Optional negative pressure attachment and oxygen diluter.

## THE DEEP BREATHER

is a compact, simplified unit for the home patient. Mouthpiece pressure *is set and sealed by technician.* Available in cylinder model, and with optional oxygen diluter.

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*For more detailed information, please request Bulletin 4727*

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**EQUIPMENT LOG** FROM: 2/20/56
TO :

| SET UP | DATE | PATIENT | ROOM | DOCTOR | INSTRUCTIONS | RETURNED CHECKED |
|---|---|---|---|---|---|---|
| Meter Mask and Regulator | 3/20 | D Jones | 202 | Lovell | 60% Concentration Check every 8 hours | 3/21 M. B. |
| Humidifier Catheter Regulator | 3/20 | Brown | 106 | Carmi | Advise Nurse to change catheter frequently. Take pateent off oxygen morning 3/21 | 3/21 M. B. |
| Model 50 Tent and Regulator | 3/20 | Kirk | 110 | MOORE | Stand by | 3/23 C. H. |
| | | | | | | |

FIGURE 2.

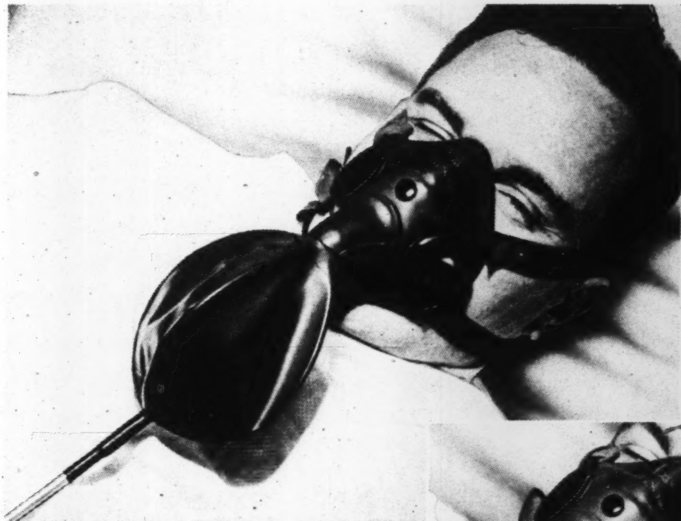
closing the cylinder valve. If the contents gauge on the regulator begins to fall, there is a leak present and the regulator should be taken out of service and repaired.

Repairing regulators is a job for an expert. It takes special jigs and tools to do the job properly; extreme care must be exercised to keep any oil or dust out of the internal parts of the regulator. Even the oil from a man's hand might be deposited on parts coming in contact with the high pressure oxygen and cause a dangerous regulator blow-out. The most sound procedure to follow when tests show that the regulator is not working properly is to send it back to the factory for repairs. The cost of repairs is usually modest, and well worth the money in safety alone.

Testing procedures on regulators and cleaning routines for masks and other pieces of equipment should be written down and kept with the log book. The log book should indicate where and when equipment was put into use, when it was returned, and leave a column in which technicians may place their initials to show that they have performed the required cleaning and testing and have returned it to ready stock. Figure 2 is a sample log book page. Many find use for more or less information than shown.

## Masks

Here are a few tips on routine handling of the most common equipment found in inhalation therapy departments. An unclean face mask can cause considerable irritation to the patient as well as cause infection. When a mask is returned from service, all metal parts if detachable should be autoclaved. All rubber parts should be



# New Four Way
## Oxygen Therapy Mask

Above, with accessory positive pressure valve.

Below, with large bore tubing, no bag.

It's a universal mask because it can be used four ways: 1. *Reservoir* type mask; 2. *Straight Rebreathing* mask, by removing center valve cover between bag and face piece; 3. *Positive Pressure* mask, with accessory positive pressure valve; 4. *Supersaturated* oxygen therapy mask, with large bore tubing, no bag.

Fits any size face; imbedded wire inserts adapt mask to all facial contours. Has interchangeable valves, detachable bag, seamless reinforcements, exhalation shield for eyeglass wearers, stomach tube orifice. And the mask can be completely disassembled for sterilizing. Write for prices and descriptive literature.

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soaked in hot water and a soap solution for at least a half-hour. Liquid detergents such as Glim or Joy have been found very satisfactory for this. Wrap the parts in gauze to prevent discoloration. After soaking the rubber parts, boil them for five minutes. Rubber parts should be allowed to dry at room temperature and then swabbed with an alcohol solution. Make sure that suitable bags or boxes are available to keep masks clean.

Where latex rubber reservoir bags are used, they should be dusted lightly with talcum powder after cleaning. This dusting helps lengthen the life of the rubber, and prevents sticking together in storage.

Where masks with sponge rubber discs are used, they should be cleaned from time to time; otherwise they accumulate dust and become clogged.

### Catheters

Rubber catheters, after each use, should be soaked one half hour in hot water and a soap solution and then boiled for five or ten minutes. Catheter holes should be inspected to make sure that they are not clogged with mucus. They should then be dipped in a solution of alcohol and wrapped for storage.

### Humidifiers

Humidifiers should not be left standing with water in them. After each use, they should be emptied, washed, dried and stored in a clean place. Humidifiers should be checked for leakage, as the gaskets may become worn. This is done by running oxygen into the humidifier and closing the outlet of the humidifier. Hissing will indicate a leak. Where certain chemicals or mineral salts in the tap water are present, clogging of the diffuser pores will occur. By using distilled water, or checking with the local water company as to the solution that will dissolve this deposit, humidifier clogging can be prevented.

### Tent Canopies

When a canopy is returned, it should be washed in a solution of soap and water, before it is used again. If desired it may be washed down with alcohol. A drying rack should be available to allow the canopies to dry completely at room temperature. Canopies should then be folded and stored in a clean dry place. Before folding, inspect the canopy for tears and rips, particularly around the zippers and hanger tabs. Holes can be repaired with Scotch tape and patches can be made with vinyl plastic saved from old canopies and vinyl cement. Don't get into the habit of rolling the canopy up into a ball and shoving it onto a shelf. Canopies are inexpensive, but proper care will prolong their life. It is not unusual when five-mil vinyl canopies are used and cared for properly to have them last for two years or more.

### Complex Equipment

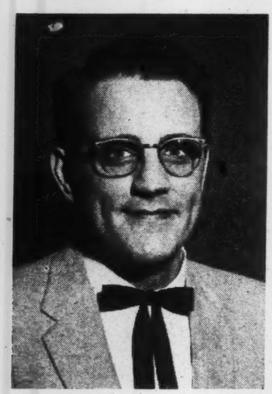
Inhalation Therapy departments, as they grow, will get more and more equipment. A hospital that does not already have intermittent positive pressure breathing appara-

tus, or apparatus to provide exsufflation with negative pressure, will have them soon. Even more complicated devices and machines for inhalation therapy are now being developed in research hospitals throughout the country. These machines that are now in research will become standard equipment in inhalation therapy departments within a few more years time. A proper routine preventive maintenance program for inhalation therapy equipment is necessary now, and will be even more necessary as more complicated machines are acquired.

The manufacturers' instruction booklets should be the guide in setting up maintenance schedules. Keep them in a safe handy place, and if one is not on hand for a particular piece of equipment, write to the manufacturer and get one. Apparatus in top working condition will save much time and trouble, as well as money; and the dividends repaid in superior performance will make preventive maintenance well worth the effort.

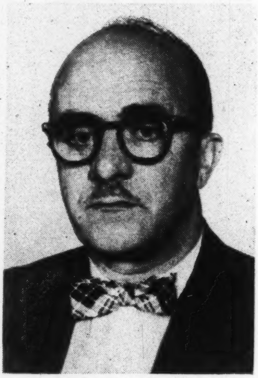
## *Know Your Directors*

**James F. Whitacre, at right, Editor of Inhalation Therapy, was elected a Director at the last Annual Meeting of the American Association of Inhalation Therapists to serve for one year. He is in charge of the Inhalation Therapy Department at Strong Memorial Hospital at the University of Rochester, Rochester, New York. A newly elected Director, who will serve a three year term, is James Sharkey. He is Senior Gas Therapy Technician, Department of Oxygen Therapy at Queen Mary's Veterans Hospital in Montreal, Quebec. Larry Fruik is Treasurer of AAIT and has recently been elected President of the Illinois Chapter. He is in charge of the Inhalation Therapy Department at Edgewater Hospital in Chicago.**



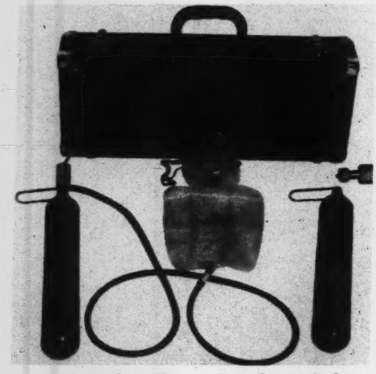
**Left:
Larry Fruik**

**Right:
James Sharkey**



## *New Equipment*

**Portable Oxygen Kit.** The O.E.M. Emergen-Ox is a small emergency oxygen kit intended for use by cardiacs, asthmatics, doctors and industrial clinics. Including the carrying case the kit weighs



approximately 9 lbs. and is about the size of an ordinary briefcase. It contains two small cylinders, with a total of 112 liters of oxygen, a regulator, a filling adaptor, and a mask.



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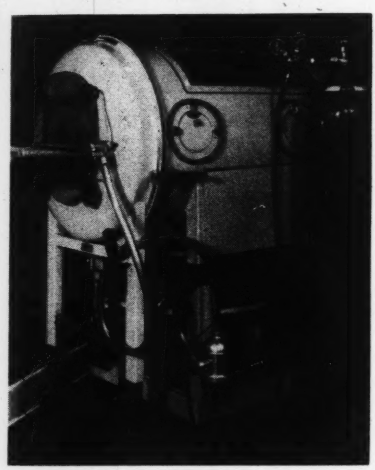
Liter flow rate is adjustable and the kit can be used to administer oxygen for as long as twenty-five minutes while waiting for larger equipment to arrive or while transporting a patient to a hospital.

**No. 211**

### Respirator Nebulizer



**To provide aerosols for the respirator patient using positive pressure, the Mistogen Nebulizer shown adapts to the Bennett positive pressure respirator attachment as illustrated. Selective nebulization is said to be instantly available and there is no need for use of the hand bulb type of nebulizer in the area of the tracheotomized airway.**

**No. 212**

## ABSTRACTS

**"Histochemical Study of Pulmonary Hyaline Membrane,"** by F. Duran-Jorda, et al, in *Arch Dis Childhood* 31:113 (Apr 56).

These British investigators have felt that pulmonary hyaline membrane is **not** caused by aspiration of amniotic fluid, and have set about proving it by showing that (1) there is no hyaline substance in amniotic fluid, and (2) the pulmonary hyaline membrane is composed of blood substances. This strengthens the theory of endogenous etiology of the membrane —i.e., that it arises from exudation. Some investigators link this with hemorrhagic pneumonia of the newborn and say that they differ only in degree. It is postulated that these are really manifestations of left ventricular failure.

The fact that high oxygen tensions can cause the same symptoms in adults is referred to, but the connection between this and giving these infants $O_2$ therapy is not touched on at all.

What they do say, though, is that since this is not aspirated amniotic fluid and is coming from within, it is somewhat futile to try to dissolve the pulmonary hyaline membrane with "medicated mists" —like "trying to cure faucial diphtheria by scraping the membrane off the throat."

**"Pulmonary Function Tests and their Clinical Application,"** by C. R. Woolf, M.D. (Toronto Gen'l Hospital), in *Canad. M.A.J.*, 75:1007 (Dec. 15, 1956).

Dr. Woolf divides respiratory function into five categories: ventilation, distribution of gas, diffusion of gas into pulmonary circulation, pulmonary circulation perfusion of alveoli, work and mechanics of breathing. Each of these can be tested, but some only by complex processes requiring expensive equipment and specially trained personnel. These are not resorted to except in cardiopulmonary research centers. There is such wide variation—of the order of plus or minus 20% of the average value—among normal individuals of the same age, sex and physical characteristics, that a test must show very

marked deviation from expected values before it can be reasonably assumed that anything is wrong. Further, the tests can only reveal altered function, and cannot give a specific diagnosis. Notwithstanding these limitations, they are a very valuable addition to the diagnostician's armamentarium.

**"Aerosol Therapy in the Practice of Allergy,"** by Samuel J. Prigal, M.D., F.A.C.P., in *N.Y. State J. Med.* 56:910, 1956.

This is an excellent review of aerosols, considering their nature, the rationale of using them, different ways of producing them and conducting them to where they can be breathed without loss of the particles en route, etc. It deals with different sorts of apparatus available, substances to be used as vehicles for the aerosolized agent to prevent its evaporation or deposition before reaching the bronchioles or alveoli, and ways of saving the aerosol—i.e., limiting its production to the time during which patient is inhaling. There is then a classification of the aerosols into bronchodilators, antibiotics and mucolytics, with discussion of each type.

The article concludes with a particularly good treatment of the limitations and abuses of aerosol therapy. Among other common faults found, he mentioned the employment of inadequate apparatus and of materials in too concentrated solutions.

**"Mechanical Treatment of Pulmonary Failure,"** by John E. Affeldt, et al, in *Post Graduate Medicine* 19:550 (June 56)

These authors evaluate the pulmonary failure arising in connection with myasthenia gravis, polio, scleroderma, asthma, emphysema and thoracoplasty.

They feel the definitive treatment for all of these cases is tracheotomy plus full tank respirator. This is, of course, somewhat radical in the opinion of more conservative workers, but they present evidence of very good results. The article has very illuminating illustrations.

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